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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Frank A. Smith  
GE Plastics  
One Plastics Avenue  
Pittsfield, MA 01201

EXAMINER

LEUNG, JENNIFER A

ART UNIT

PAPER NUMBER

1764

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/824,886	<b>Applicant(s)</b> BRUIN ET AL.	
	<b>Examiner</b> Jennifer A. Leung	<b>Art Unit</b> 1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13, 15 and 16 is/are rejected.
- 7) ☒ Claim(s) 14 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \*   c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) <u>4/3/2001</u>                | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>10/17/2002</u> | 6) <input type="checkbox"/> Other: _____                                    |

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## **DETAILED ACTION**

### ***Priority***

1. The application priority should be updated to read as follows:

-- This is a divisional of application Serial No. 09/457,320 filed on December 8, 1999, now U.S. Patent No. 6,294,684, which is incorporated herein by reference. --

### ***Drawings and Specification***

2. The drawings and specification have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware.

### ***Claim Objections***

3. Claims 13 and 14 are objected to because of the following grammatical informalities:

- In claim 13, "column" (line 4) should be changed to -- columns --.
- In claim 14, "a" (line 1) should be omitted.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 13-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, because in claim 13, it is unclear as to where the body of the claim begins (i.e., after transitional term "comprising" in line 3, or after "wherein:" in line 5).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison et al. (5,426,207).

Regarding claim 13, Harrison (FIG. 1) discloses an apparatus comprising first, second and third reactive distillation columns (primary reactor 4, secondary reactor 24, and tertiary reactor 39, respectively); a "methanol recovery section" having first and second rectification columns (distillation column 63 and further distillation column 81, respectively); and a plurality of lines for transporting reactant and product streams, wherein:

(a) the first reactive distillation column (4) is connected to input lines (catalyst 1, phenol 2, dimethyl carbonate 3) and to first (22) and second (23) transfer lines; said first transfer line (22) running from the top of the first reactive distillation column (4) to the "methanol recovery section" (i.e., to the middle of the first rectification column 63 via line 33 to input lines 62 and 65) and said second transfer line (23) running from the bottom of the first reactive distillation column (4) to the second reactive distillation column (24)

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(column 9, lines 10-25, 38-40, 59-64; column 10, lines 5-8, 61-68);

- (b) the second reactive distillation column (24) is connected to the third (31) and fourth (32) transfer lines; said third transfer line (31) running from the top of the second reactive distillation column (24) to the "methanol recovery section (i.e., to the middle of the first rectification column 63 via line 33 to input lines 62 and 65) and the fourth transfer line (32) running from the bottom of the second reactive distillation column (24) to the third reactive distillation column (39) (column 10, lines 5-34); and
- (c) the third reactive distillation column (39) is connected to a first output line (43) for providing diaryl carbonate product (i.e., diphenyl carbonate; column 11, lines 61-64) from the bottom of the third reactive distillation column (39), and a first recycle line (42) running from the top of the third reactive distillation column (39) to the "methanol recovery unit" (i.e., to the middle of the first rectification column 63 via line 55 to input lines 62 and 65).

The "methanol recovery section" is configured such that,

- (d) the first rectification column (63) is connected to a second product line (66) for providing dialkyl carbonate/alkyl alcohol azeotrope (i.e., a methanol-rich azeotrope containing methanol and dimethyl carbonate; column 11, lines 8-16) from the top of the column (63); and
- (e) the second rectification column (81) is connected to a third product line (line 83/99/132) for recovering alkyl aryl ethers (i.e., anisole), and a third recycle line (83/97) running from the top of the column (81) back to the top of the column (81) (column 11, lines 40-60; column 12, lines 33-44).

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Following the processing of overhead streams (22), (31) and (42) in the first and second rectification columns (63) and (81) of the "methanol recovery section", the processed stream comprising mostly phenol and dimethyl carbonate is recycled to the bottom of the first reactive distillation column (4) via line (9).

The apparatus of Harrison substantially illustrates the inventive concepts of applicant's instantly claimed invention; namely, an apparatus comprising a series of three reactive distillation columns and a series of two rectification columns, for the production of a diaryl carbonate and the separation of an alkyl alcohol and other reaction by-products by distillation to produce useful recycle streams.

Although Harrison may be silent as to the instantly claimed connecting locations of the transport lines between the reaction zone (i.e., reactive distillation columns 4, 24 and 39) and the separation zone (i.e., the "methanol recovery section"), Harrison additionally disclose that the teachings of the present invention as illustrated are by way of example only, and that "[a]ny other suitable arrangement of equipment fulfilling the requirements of the invention may be used in place of the illustrated equipment in accordance with normal chemical engineering techniques." (column 8, lines 36-63). Therefore, according to the teachings of Harrison, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to select an appropriate configuration for the connecting locations of the transport lines between the reaction and separation zones in the apparatus of Harrison, on the basis of suitability for the intended use and absent showing any unexpected results, for the purpose of fulfilling the same requirements of the disclosed invention. Additionally, the shifting of the location of parts involves only ordinary skill in the art, and where the processes are substantially

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identical or equivalent in terms of function, manner and result, rearrangement of process steps or does not patentably distinguish the processes.

Regarding claim 15, Harrison discloses an augmentation line (i.e., line 154, 37 and/or 35) connected to the fourth transfer line (32) for introduction of an augmenting reactant stream into the third reactive distillation column (39) (column 13, lines 12-15; column 10, lines 22-31).

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison et al. (5,426,207), as applied to claim 13 above, and further in view of Rechner et al. (U.S. 5,523,451).

Harrison discloses reactive distillation columns (4), (24), (39) comprising a reactive portion and a rectification portion, and the columns may further comprise a structured packing or fixed internals (i.e., 25, 40, 41; 17, 26, 44) (column 9, lines 26-48; column 10, lines 5-18, 34-44). However, Harrison is silent as to providing "10 to 60 theoretical distillation steps" in each column using the structured packing or fixed internals. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate number of theoretical distillation steps for the reactive distillation columns in the apparatus of Harrison, since the precise number of theoretical steps would have been considered a result effective variable by one having ordinary skill in the art. Also, it is noted that the present specification sets forth on page 5, lines 10-13, that the claimed number of theoretical steps, is at best, a preferred limitation. As such, without more, the claimed number cannot be considered "critical". Accordingly, one having ordinary skill in the art would have routinely optimized the number of theoretical distillation steps in each of the respective columns (4), (24) and (39) to obtain the desired product conversions, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the

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prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Additionally, Rechner et al. teach a typical number of theoretical distillation steps for a system of reactive distillation columns for generating diaryl carbonates, wherein the theoretical number of plates may range between 1 and 50 (column 11, lines 5-9).

***Allowable Subject Matter***


7. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, as the prior art of record does not disclose or adequately teach a fifth and sixth transfer line running in opposing directions between the bottom of the first rectification column and the top of the second reactive distillation column, for providing heat and mass integration between the two columns.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is 703-305-4951. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 703-308-6824. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung   
September 29, 2003

  
**HIEN TRAN**  
**PRIMARY EXAMINER**